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CHABA

SIXTH ANNUAL REPORT

OF THE

ARMED FORCES-NATIONAL RESEARCH COUNCIL
COMMITTEE ON HEARING AND BIO-ACOUSTICS

1 June 1958 to 31 May 1959

Prepared by

Hallowell Davis
Donald H. Eldredge
Shirley K. Hirsh
of the
Office of the Executive Secretary

Armed Forces-National Research Council
Committee on Hearing and Bio-Acoustics

Office of the Executive Secretary
Central Institute for the Deaf
818 South Kingshighway
St. Louis 10, Missouri

Technical Report No. 16
to the Office of Naval Research
Contract No. Nonr 1151 (01), NR 140-069

## SUMMARY OF THE SIXTH ANNUAL REPORT

The Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics held one full meeting in the year covered by this report. A summary of the meeting is included in this report.

The CHABA Council met three times during the year, and accepted formal or informal reports from the four Working Groups. Three new Working Groups were appointed. On 31 May 1959, six Working Groups had active status.

The activities of the CHABA Council and of the several Working Groups are summarized in the body of this report. A cumulative list of CHABA reports and of CHABA material which has appeared in professional journals will be found at the end of the report.

TABLE OF CONTENTS

Statement of Purposes and Methods of Operation

## THE ARMED FORCES-NATIONAL RESEARCH COUNCIL COMMITTEE ON HEARING AND BIO-ACOUSTICS

The Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics (CHABA) was organized late in 1952 to provide a group of informed consultants who could answer questions in the general area of hearing and bio-acoustics. Within its broad scope, CHABA absorbed many functions of the National Research Council's earlier Committee on Hearing. CHABA consults with and advises the Armed Services in such general areas as:

1) Auditory physiology, psycho-acoustics, and auditory standards.

2) Communications, particularly speech communications in noise.

3) The psychological and social reactions of man to noise.

4) The auditory and non-auditory effects of high-intensity acoustic energy on man (sound, vibration and blast).

5) The means of protection against the undesirable effects of acoustic energy.

6) The relevant physical and engineering problems of the generation, measurement and control of acoustic energy.

CHABA activities are supported by funds contributed equally by the Army, the Navy and the Air Force. The Secretariat and the continuing operation of the Committee have been provided by the Central Institute for the Deaf under contract with the Office of Naval Research. The Office of Naval Research acts as contracting agent for the three Armed Services. On 1 September 1959 the Secretariat will be transferred to Washington, D. C. under the auspices of the National Research Council.

CHABA IS A RESEARCH ADVISORY ORGANIZATION. IT IS NOT A CONTRACTING AGENCY AND DOES NOT DISPENSE FUNDS. IT MAY, HOWEVER, RECOMMEND THAT RESEARCH ALONG CERTAIN LINES BE CARRIED OUT.

### The Council

CHABA's activities are planned and directed by a Council composed of six to nine members. The Army, Navy, and Air Force each have a Representative, and the National Research Council appoints three to six members. The Council selects from its membership a Chairman and a Deputy Chairman (for two year terms), and an Executive Secretary.

The Council receives the reports of CHABA Working Groups and transmits them through the Secretariat to the requesting agency, either with or without additional comment or endorsement.

The Council usually meets two or three times a year.

## The Committee

The full Committee on Hearing and Bio-Acoustics consists of about one hundred and twenty regular members, of whom about thirty-seven are civilians appointed by the National Research Council. The latter appointments include "engineers and scientists who are qualified by training, experience, or employment in the fields of acoustics, vibrations, psychology, physiology, or medicine." Several government agencies with interest in this general area appoint about fifteen affiliated members to the Committee for liaison purposes. In appointing its committee members the National Research Council (NRC) receives suggestions from the CHABA Council but is not bound by them. The common objective is to appoint a group of members who will adequately represent the several current CHABA interests and also those which can be reasonably foreseen. The Committee is purposely kept limited in size and a policy of rotation of membership has been adopted.

The Committee meets annually, usually in October in the Washington area. The meetings are restricted to the actual CHABA membership and specially invited guests, in order to preserve an intimate atmosphere of free discussion. A Committee member is expected to attend this meeting and take part in discussions of those topics in which he is an expert. Except for travel expenses in connection with attending meetings, NRC members serve without financial compensation unless they are asked to serve on one of the Working Groups.

## Working Groups

The major work performed by CHABA is accomplished by Working Groups composed of committee members, often supplemented by invited consultants or former members. Working Groups are formed to work on problems brought to the Council by the Representatives of the three Armed Services. National Research Council members of the Working Groups are paid for their time spent on work in these groups and are provided traveling expenses. The Council selects the membership of these groups on the basis of the fields of knowledge which should be represented in the solution to the problem. When a Working Group has prepared its report, the Council has the responsibility of accepting and transmitting it to the requesting agency either with or without additional comment or endorsement.

## The Secretariat

The Executive Secretary and his staff provide continuity of activity between meetings of the Council. Either alone or with the advice of other specialists, and subject to later endorsement by the Council, they may answer questions from the Armed Services that do not require the appointment of a Working Group. They also make the arrangements for the Committee, Council and Working Group meetings. They edit and prepare the various CHABA reports for distribution and/or publication.

The Secretariat has been located at the Central Institute for the Deaf, 818 South Kingshighway, St. Louis 10, Missouri, and was composed of members of the staff of that institution. Under the terms of the contract with the Office of Naval Research, the Secretariat and Central Institute for the Deaf conducted the financial affairs of CHABA, subject to the approval of the ONR Scientific Officer. Hallowell Davis, M.D. has been Executive Secretary, Donald H. Eldredge, M.D., Technical Aide, and J. Richardson Usher, Ph.D., Secretary to the Working Groups.

On or before 1 September 1959, the functions of the Secretariat will be transferred to the National Research Council in Washington, D. C., and Dr. Milton Whitcomb will become the Executive Secretary.

## Distribution of Reports

Working Group Reports, Reports of Annual CHABA Meetings, and any other CHABA Technical Reports are prepared by the Secretariat and distributed to the CHABA membership and to a Department of Defense mailing list furnished by the Scientific Officer in the Office of Naval Research. Reports that are of sufficiently general interest usually will be published in s ientific periodicals. These reports are also available for general distribution through:

Office of Technical Services
Technical Information Branch
Department of Commerce
Washington, D.C.

and, for those eligible for the service, through:

Armed Services Technical Information Agency
Document Service Center
Knott Building
Dayton, Ohio

## Consulting Service

Requests for CHABA advice and questions directed to CHABA are submitted through the Armed Service Representatives on the Council. These are:

ARMY:
Charles W. Hill, Colonel, (MSC) USA
U.S. Army Medical Research & Development Command
Main Navy Building
Washington 25, D.C.

NAVY:
Charles F. Gell, Captain, (MC) USN
Code 408
Office of Naval Research
Washington 25, D.C.

AIR FORCE:
Ralph N. Kraus, Colonel USAF (MC)
USAF School of Aviation Medicine
Randolph Air Force Base
Randolph Field, Texas

Liaison with the National Research Council is through the Executive Secretary of the Division of Anthropology and Psychology of the National Research Council. He is:

Dr. Glen Finch
Executive Secretary, Division of Anthropology and Psychology
National Academy of Sciences-National Research Council
2101 Constitution Avenue
Washington 25, D.C.

CHABA activities are of interest to the Divisions of Physical Sciences, Medical Sciences, Anthropology and Psychology, Engineering and Industrial Research, and Biology and Agriculture of the National Research Council.

MEMBERSHIP LIST

1 June 1958 - 31 May 1959

THE COUNCIL

NRC Appointees

Dr. Gordon Hoople
1100 East Genesee Street
Syracuse 10, New York

Committee: '53, '54, '55
Council: '56, '57, '58,

Dr. Frederick V. Hunt
Division of Engineering &
Applied Physics
Harvard University
Cambridge 38, Massachusetts

Committee: '56
Council: '57, '58, '59

Dr. William D. Neff
Section of Bio-Psychology
Faculty Exchange
University of Chicago
Chicago 37, Illinois

Committee: '53, '54
Council: '55, '56, '57, '58, '59
Chairman: '57-'59

Army Representative

Col. Charles S. Gersoni (MSC) USA
Department of Physical Standards Research
Walter Reed Army Institute of Research
Walter Reed Army Medical Center
Washington 12, D.C.

Designated: Committee, 3 Sept. '54
Council: 24 Oct. '55
Relieved: 12 Jan. '59

Col. Charles W. Hill (MSC) USA
U.S. Army Medical Research & Development Command
Main Navy Building
Washington 25, D.C.

Designated: Committee, 19 July '57
Council: 12 Jan. '59

Navy Representative

Capt. Clifford P. Phoebus (MC) USN
Special Assistant for Bio-Sciences
Office of Naval Research
Department of the Navy
Washington, D.C.

Designated: Committee, 10 Mar. '53
Council: 18 Oct. '54
Chairman: '55-'56
Relieved: 23 July '58

Capt. Charles F. Gell (MC) USN
Code 408
Office of Naval Research
Department of the Navy
Washington 25, D.C.

Designated: Council, 23 July '58

## Air Force Representative

Col. Ralph N. Kraus USAF (MC)
USAF School of Aviation Medicine
Randolph Air Force Base
Randolph Field, Texas

Designated: Committee, 30 June '55
Council: 20 June '58
Chairman: '59

## Alternate Council Representative:

Col. Charles H. Roadman
USAF (MC)
Chief, Human Factors Division
Directorate of Research and Development
Office, Deputy Chief of Staff
Headquarters, U.S. Air Force
Washington 25, D.C.

Designated: 16 Sept. '55

## Members at Large

Dr. Hallowell Davis
Central Institute for the Deaf
818 South Kingshighway
St. Louis 10, Missouri

Executive Secretary: '53, '54, '55, '56, '57, '58,

Dr. J. C. R. Licklider
Bolt, Beranek and Newman
50 Moulton Street
Cambridge 38, Massachusetts

Committee: '54, '55, '56
Council: '57, '58, '59

Mr. Matha M. Miller
Chief, Acoustics Section
Douglas Aircraft Company
Santa Monica, California

Committee: '57
Council: '58, '59

## Technical Aide

Dr. Donald H. Eldredge
Central Institute for the Deaf
818 South Kingshighway
St. Louis 10, Missouri

February 1953

## NRC Liaison Officer

Dr. Glen Finch
Executive Secretary
Division of Anthropology and Psychology
National Academy of Sciences
National Research Council
2101 Constitution Avenue
Washington, D.C.

## ONR Scientific Officer

Dr. Richard Trumbull
Head, Physiological Psychology Branch
Office of Naval Research
Department of the Navy
Washington 25, D.C.

Designated: 15 Nov. '54

## Secretary to the Working Groups

J. Richardson Usher
Central Institute for the Deaf
818 South Kingshighway
St. Louis 10, Missouri

October 1955
Resigned: 30 Nov. '58

## THE COMMITTEE

### National Research Council Appointed Members

| | One-year appointments beginning 1 July |
|---|---|
| Dr. Robert W. Benson<br>Armour Research Foundation<br>Physics Research Department<br>3440 South State Street<br>Chicago 16, Illinois | '58 |
| Dr. Richard H. Bolt<br>Acoustics Laboratory<br>Massachusetts Institute of Technology<br>Cambridge 39, Massachusetts | Council: '53-'56<br>Committee: '57, '58 |
| Dr. Paul Borsky<br>National Opinion Research Center<br>100 Fifth Avenue<br>New York 11, New York | '57, '58 |
| Dr. Jerome R. Cox, Jr.<br>Central Institute for the Deaf<br>818 South Kingshighway<br>St. Louis 10, Missouri | '58 |
| Dr. James F. Curtis<br>Department of Speech Pathology and Audiology<br>State University of Iowa<br>Iowa City, Iowa | '58 |
| Dr. James P. Egan<br>Hearing and Communication Laboratory<br>Indiana University<br>Bloomington, Indiana | '57, '58 |
| Dr. Edmund P. Fowler, Jr.<br>180 Fort Washington Avenue<br>New York 32, New York | '56, '57, '58 |
| Dr. Meyer S. Fox<br>Suite 401<br>2040 West Wisconsin Avenue<br>Milwaukee 3, Wisconsin | '58 |

## THE COMMITTEE

### National Research Council Appointed Members

| | One-year appointments beginning 1 July |
|---|---|
| Dr. Frank Geldard<br>Psychological Laboratory<br>University of Virginia<br>Charlottesville, Virginia | '57, '58 |
| Dr. David M. Green<br>Room 52-071<br>Massachusetts Institute of Technology<br>Cambridge 39, Massachusetts | '58 |
| Dr. Thrift G. Hanks<br>Director of Health & Safety<br>Boeing Airplane Company<br>Seattle 24, Washington | '56, '57, '58 |
| Dr. Howard C. Hardy<br>Suite 347<br>22 West Madison Street<br>Chicago 2, Illinois | '56, '57, '58 |
| Dr. Mones E. Hawley<br>Radio Corporation of America<br>Moorestown, New Jersey | '58 |
| Mr. John K. Hilliard<br>Altec-Lansing Corporation<br>9356 Santa Monica Boulevard<br>Beverly Hills, California | '56, '57, '58 |
| Dr. Harvey H. Hubbard<br>Dynamic Loads Division<br>Langley Research Center, NASA<br>Langley Field<br>Hampton, Virginia | '58 |
| Dr. Uno Ingard<br>Department of Physics<br>Massachusetts Institute of Technology<br>Cambridge 39, Massachusetts | '56, '57, '58 |
| Dr. Lloyd A. Jeffress<br>Defense Research Laboratory<br>The University of Texas<br>P.O. Box 8029<br>Austin 12, Texas | '56, '57, '58 |
| Dr. Karl Kryter<br>Bolt, Beranek & Newman<br>50 Moulton Street<br>Cambridge 38, Massachusetts | '58<br>(Air Force member: 9 May '53-17 Oct. '57) |

## THE COMMITTEE

### National Research Council Appointed Members

| | One-year appointments beginning 1 July |
|---|---|
| Dr. Robert W. Leonard<br>University of California<br>405 Hilgard Avenue<br>Los Angeles 24, California | '58 |
| Dr. Nello Pace<br>Department of Physiology<br>School of Medicine<br>University of California<br>Berkeley 4, California | '57, '58 |
| Prof. Walter A. Rosenblith<br>Research Laboratory of Electronics<br>Room 20 B-221<br>Massachusetts Institute of Technology<br>Cambridge 39, Massachusetts | Committee: '53, '54, '57, '58<br>Council: '55, '56 |
| Mr. Vincent Salmon<br>Sonics & Mechanics Section<br>Department of Physics<br>Stanford Research Institute<br>Menlo Park, California | '56, '57, '58 |
| Dr. Newell D. Sanders<br>Chief, Physics Division<br>Lewis Research Center, NASA<br>21000 Brookpark Road<br>Cleveland 11, Ohio | '56, '57, '58 |
| Dr. Joseph Sataloff<br>1721 Pine Street<br>Philadelphia 3, Pennsylvania | '58 |
| Dr. Arnold M. Small<br>Chief, Reliability, Human Factors & Acoustics<br>Convair, P.O. Box 1950<br>San Diego 12, California | '56, '57, '58 |
| Dr. Preston W. Smith, Jr.<br>Editor, Noise Control<br>1278 Massachusetts Avenue<br>Cambridge 38, Massachusetts | '58 |
| Dr. Kenneth N. Stevens<br>Research Laboratory of Electronics<br>Massachusetts Institute of Technology<br>Cambridge 39, Massachusetts | '56, '57, '58 |

## THE COMMITTEE

### National Research Council Appointed Members

| | One-year appointments beginning 1 July |
|---|---|
| Dr. W. Dixon Ward<br>Subcommittee on Noise<br>111 North Bonnie Brae Street<br>Los Angeles 26, California | '58 |
| Dr. Peter J. Westervelt<br>Brown University<br>180 Hope Street<br>Providence, Rhode Island | '57, '58 |
| Dr. Francis M. Wiener<br>Bolt, Beranek & Newman<br>50 Moulton Street<br>Cambridge 38, Massachusetts | '58 |
| Dr. Josef Zwislocki<br>Bioacoustics Laboratory<br>Syracuse University Research Institute<br>Syracuse 10, New York | '57, '58 |

### Army Designated Members

| | Date designated |
|---|---|
| Major James P. Albrite (MC) USA<br>Director, Audiology and Speech Correction Center<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | Council: 4 Jan. '55<br>Relieved: 24 Oct. '55<br>Committee: 24 Oct. 55 |
| Col. William H. Byrne (MC) USA<br>Surgeon<br>U.S. Army Aviation Center<br>Fort Rucker, Alabama | 21 Feb. '58 |
| Mr. Alexander Cohen<br>QM Research & Engineering Command<br>Natick, Massachusetts | 16 Oct. '58 |
| Alternate: | |
| Dr. E. Ralph Dusek<br>QM Research & Engineering Command<br>Natick, Massachusetts | 22 Jan. '58 |
| Capt. John L. Fletcher (MSC) USA<br>Psychology Department<br>Army Medical Research Laboratory<br>Fort Knox, Kentucky | 25 Nov. '55 |

## THE COMMITTEE

### Army Designated Members

| | Date designated |
|---|---|
| Dr. Robert Galambos<br>Neuropsychiatry Division<br>Army Medical Service Graduate School<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 1 July '55 (NRC member: '53, '54) |
| Mr. F. Thomas Galloway<br>Supervisor, Psychoacoustic Section,<br>Audiology & Speech Correction Center<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 11 Sept. '57 |
| Dr. Henry F. Gaydos<br>QM Research & Development Command<br>Natick, Massachusetts | 10 Aug. '56<br>Relieved: 16 Oct. '58 |
| Col. John R. Hall, Jr. (MC) USA<br>Chief, Occupational Health Branch<br>Preventive Medicine Division<br>Office of the Surgeon General<br>Room 2522, Main Navy Building<br>Washington 25, D.C. | 27 Sept. '55<br>Relieved: 24 Oct. '58 |
| Lt. Col. Robert Holmes (MC) USA<br>Biophysics Research & Development Command<br>Office of the Surgeon General<br>Department of the Army<br>Washington 25, D.C. | 24 Oct. '58 |
| Mr. John R. Jones<br>Audiology & Speech Correction Center<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 14 Oct. '58 |
| Lt. Col. Charles W. Kraul (MC) USA<br>Chief, Occupational Health Branch<br>Preventive Medicine Division<br>Office of the Surgeon General<br>Department of the Army<br>Washington 25, D.C. | 24 Oct. '58 |
| Dr. Merle Lawrence<br>Institute of Industrial Health<br>University of Michigan<br>4506 Kresge Medical Research Building<br>Ann Arbor, Michigan | 28 Sept. '56 |

## THE COMMITTEE

### Army Designated Members

| | Date designated |
|---|---|
| Dr. Michel Loeb<br>Sound Section<br>Department of Psychology<br>Army Medical Research Laboratory<br>Fort Knox, Kentucky | 5 May '58 (3 Sept. '54-<br>25 Nov. '55) |
| Dr. Nicholas B. Louis<br>Human Research Unit No. 1, CONARC<br>The Armored Center<br>Fort Knox, Kentucky | 29 Oct. '56 (11 Mar. '53-<br>3 Sept. '54) |
| Col. C. B. Meador (MC) USA<br>Department of Physical Standards Research<br>Walter Reed Army Institute of Research<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 25 Nov. '55 |
| Major Wayne C. Otto (MC) USA<br>Office of the Chief, Physical Standards Consultant<br>Professional Division<br>Office of the Surgeon General<br>Department of the Army<br>Washington 25, D.C. | 24 Oct. '58 |
| Dr. David McK. Rioch<br>Technical Director, Neuropsychiatry Division<br>Army Medical Service Graduate School<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 28 Dec. '53 |
| Mr. Arthur Riopelle<br>Army Medical Research Laboratory<br>Fort Knox, Kentucky | 19 July '57 |
| Dr. R. Edwin Shutts<br>Chief Supervisor<br>Audiology & Speech Correction Center<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 4 Jan. '55<br>Relieved: 24 Oct. '58 |
| Dr. Philip I. Sperling<br>U. S. Army Medical Research & Development Command<br>Main Navy Building<br>Washington 25, D.C. | 24 Oct. '56 |

## THE COMMITTEE

### Army Designated Members

| | Date designated |
|---|---|
| Dr. John Weisz<br>Human Engineering Laboratory<br>Aberdeen Proving Grounds<br>Maryland | 5 May '57 |
| Mr. Maurice B. Whitlock, Jr.<br>Audiology & Speech Correction Center<br>Walter Reed Army Medical Center<br>Washington 12, D.C. | 31 Mar. '55<br>Relieved: 14 Oct. '58 |

### Navy Designated Members

| | |
|---|---|
| Dr. Harlow Ades<br>U.S. Naval School of Aviation Medicine<br>U.S. Naval Air Station<br>Pensacola, Florida | 23 July '58 (NRC member: '55-'58) |
| Capt. Norman L. Barr (MC) USN<br>Bldg. 7, Room 7107<br>Bureau of Medicine & Surgery<br>Potomac Annex<br>Washington 25, D.C. | 14 June '56 |
| Dr. John Black<br>Department of Speech<br>Ohio State University<br>Columbus, Ohio | 16 Mar. '53<br>Relieved: 23 July '58 |
| Dr. J. T. Dailey<br>Technical Director, Research Division<br>Bureau of Naval Personnel<br>Department of the Navy<br>Washington 25, D.C. | 29 Jan. '53<br>Relieved: 10 July '58 |
| Mr. William J. Finney<br>Naval Research Laboratory<br>Washington 25, D.C. | 11 Mar. '53 |
| Mr. Sidney Friedman<br>Head, Personnel Measurement Research Branch<br>Personnel Research Division<br>Bureau of Naval Personnel<br>Department of the Navy<br>Washington 25, D.C. | 10 July '58 |

THE COMMITTEE

Navy Designated Members

| | Date designated |
|---|---|
| Alternate: | |
| Mr. Victor Fields<br>Assistant Head, Classification and Survey Research Branch<br>Bureau of Naval Personnel<br>Department of the Navy<br>Washington 25, D.C. | 29 Jan. '53 |
| Dr. Robert S. Gales<br>Head, Psychophysics Branch<br>Human Factors Division<br>U.S. Navy Electronics Laboratory<br>San Diego 52, California | 5 Mar. '53 |
| Cdr. David E. Goldman (MSC) USN<br>Naval Medical Research Institute<br>National Naval Medical Center<br>Bethesda 14, Maryland | 11 Mar. '53 |
| Capt. Alan D. Grinsted (MSC) USN<br>Head, Aviation Psychology Branch, Code 537<br>Aviation Medicine Division<br>Bureau of Medicine & Surgery<br>Department of the Navy<br>Washington 25, D.C. | 19 Sept. '55 |
| Dr. Fred Harbert<br>Professor of Otolaryngology<br>Jefferson Medical College<br>1025 Walnut Street<br>Philadelphia 7, Pennsylvania | 13 Dec. '55 |
| Dr. J. Donald Harris<br>Head, Sound Branch Research Division<br>U.S. Naval Medical Research Laboratory<br>U.S. Naval Submarine Base<br>New London, Connecticut | 11 Mar. '53 |
| Alternate: | |
| Dr. Richard H. Ehmer<br>U.S. Naval Medical Research Laboratory<br>U.S. Naval Submarine Base<br>New London, Connecticut | 27 Oct. '55 |

## THE COMMITTEE

### Navy Designated Members

| | Date designated |
|---|---|
| Mr. David C. Hughes<br>Bureau of Ships, Code 375<br>Department of the Navy<br>Washington 25, D.C. | 21 Aug. '57 |
| Mr. John F. Hyland<br>Ship Technical Division<br>Bureau of Ships, Code 565E<br>Department of the Navy<br>Washington 25, D.C. | 5 July '56 |
| Alternate: | |
| Mr. Walter K. Dau<br>Ship Technical Division<br>Bureau of Ships, Code 565E<br>Department of the Navy<br>Washington 25, D.C. | 11 Oct. '54<br>Relieved 28 Oct. '58 |
| Cdr. W. L. Jones (MC) USN<br>Room 1 W45, "W" Building<br>Department of the Navy<br>Washington 25, D.C. | 13 Jan. '56 |
| Dr. Elias Klein<br>Code 5104<br>Naval Research Laboratory<br>Washington 25, D.C. | 8 July '57 |
| Mr. Emmanuel S. Mendelson<br>Research Scientist<br>Naval Air Materiel Center, NAES<br>Philadelphia 12, Pennsylvania | 11 Mar. '53 |
| Capt. J. C. Pollard (MC) USN<br>Research Division<br>Bureau of Medicine & Surgery<br>Department of the Navy<br>Washington 25, D.C. | 23 July '58 |
| Mr. Aubrey W. Pryce<br>Head, Acoustics Branch, Code 411<br>Earth Sciences Division<br>Office of Naval Research<br>Department of the Navy<br>Washington 25, D.C. | 23 Aug. '56 |
| Dr. Clifford P. Seitz<br>Special Devices Center<br>Sands Point<br>Port Washington, New York | 2 April '53<br>Relieved: 23 July '58 |

## THE COMMITTEE

### Navy Designated Members

| | Date designated |
|---|---|
| Capt. L. B. Shone (MC) USN<br>Preventive Medicine Division<br>Bureau of Medicine & Surgery<br>Department of the Navy<br>Washington 25, D.C. | 20 July '55 |
| Cdr. J. Siegel (MSC) USN<br>Preventive Medicine Division<br>Bureau of Medicine & Surgery<br>Department of the Navy<br>Washington 25, D.C. | 20 July '55 |
| Dr. Steven Stuntz<br>U.S. Navy Underwater Sound Laboratory<br>Fort Trumbull<br>New London, Connecticut | 23 July '58 |
| Dr. Gilbert Tolhurst<br>U.S. Naval School of Aviation Medicine<br>U.S. Naval Air Station<br>Pensacola, Florida | 24 Nov. '54 |
| Dr. Richard Trumbull<br>Head, Physiological Psychology Branch, Code 454<br>Office of Naval Research<br>Washington 25, D.C. | 1 July '58 |
| Dr. John C. Webster<br>Code 2124<br>U.S. Navy Electronics Laboratory<br>San Diego 52, California | 27 April '56 |

### Air Force Designated Members

| | |
|---|---|
| Dr. Charles W. Bray<br>HQ, Human Resources Research Center<br>Attn: DCS/O<br>Lackland Air Force Base, Texas | 9 May '53<br>Relieved: 9 April '58 |
| Mr. Francis A. Brogan<br>USAF School of Aviation Medicine<br>Randolph Air Force Base<br>Randolph Field, Texas | 7 July '53 |

## THE COMMITTEE

### Air Force Designated Members

| | Date designated |
|---|---|
| Lt. Col. Cardis W. Bryan USAF<br>Preventive Medicine Division<br>Office of the Surgeon General<br>HQ, United States Air Force<br>Washington 25, D.C. | 6 June '58 |
| Col. J. C. Carmichael USAF (MSC)<br>HQ, Air Materiel Command<br>Attn: MCDPE<br>Wright-Patterson Air Force Base,<br>Ohio. | 21 Sept. '55 |
| Dr. Julien Christensen<br>Wright Air Development Center<br>Attn: WCRDP<br>Wright-Patterson Air Force Base,<br>Ohio. | 9 May '53<br>Relieved: 26 Feb. '59 |
| Mr. D. A. Dickey<br>Address:<br>Commander,<br>Wright Air Development Center<br>Attn: WCLB, Mr. D. A. Dickey<br>Wright-Patterson Air Force Base,<br>Ohio. | 9 May '53 |

Deputy Member:

| | |
|---|---|
| Mr. Allan Watton, Jr.<br>Address:<br>Commander<br>Wright Air Development Center<br>Attn: WCLBS, Mr. Allan Watton, Jr.<br>Wright-Patterson Air Force Base,<br>Ohio | 9 May '53 |
| Col. G. K. Fair USAF<br>Chief, Aviation Medicine Division<br>Office of the Surgeon General<br>HQ, United States Air Force<br>Washington 25, D.C. | 9 Sept. '55 |
| Lt. Col. Gordon F. Fisher USAF (MC)<br>Preventive Medicine Division<br>Office of the Surgeon General<br>HQ United States Air Force<br>Washington 25, D.C. | 19 July '57 |
| Col. Jay F. Gamel USAF (MC)<br>Office of the Surgeon (MCD)<br>HQ, Air Material Command<br>Wright-Patterson Air Force Base,<br>Ohio | 24 Sept. '53 |

## Air Force Designated Members

Date designated

Dr. H. E. von Gierke — 9 May '53
Address:
Commander
Wright Air Development Center
Attn: WCLDN, Dr. H. E. von Gierke
Wright-Patterson Air Force Base,
Ohio

Deputy Member:

Major Elizabeth Guild USAF — 9 May '53
Address:
Commander
Wright Air Development Center
Attn: WCLDN, Major Elizabeth Guild
Wright-Patterson Air Force Base,
Ohio

Dr. Frank W. Hartman — 31 July '56
Medical Research Advisor,
AFCSG-10.2
Directorate of Professional
Services
Office of the Surgeon General, USAF
Washington 25, D.C.

Dr. A. W. Hetherington — 9 May '53
HQ, Air Research & Development
Command
P.O. Box 1395, Attn: RDDH-2
Baltimore, Maryland

Dr. C. M. Kos — 9 Sept. '55
Professor, Department of Otolaryn-
gology & Maxillofacial Surgery
University Hospitals
State University of Iowa
Iowa City, Iowa
(National Consultant,
Consultant's Group
Office of the Surgeon General, USAF
Washington 25, D.C.)

Col. Alvin F. Meyer, Jr. USAF (MSC) — 9 May '53
Office of the Surgeon
HQ, Strategic Air Command
Offutt Air Force Base, Nebraska

THE COMMITTEE

Air Force Designated Members

| | Date designated |
|---|---|
| Mr. C. M. Michaels<br>Address:<br>Commander<br>Wright Air Development Center<br>Attn: WCLPO, Mr. C. M. Michaels<br>Wright-Patterson Air Force Base,<br>Ohio | 24 Sept. '56 |
| Lt. Col. C. N. Moss USAF (MC)<br>Industrial Medical Officer<br>Preventive Medicine Division<br>Office of the Surgeon General<br>HQ, United States Air Force<br>Washington 25, D.C. | 9 Sept. '56 |
| Capt. Max O'Connell USAF<br>Address:<br>Commandant<br>School of Aviation Medicine, USAF<br>Attn: SAMCLNM, Capt. Max O'Connell<br>Randolph Air Force Base<br>Randolph Field, Texas | 7 June '58 |
| Dr. H. O. Parrack<br>Address:<br>Commander<br>Wright Air Development Center<br>Attn: WCLOT, Dr. H. O. Parrack<br>Wright-Patterson Air Force Base,<br>Ohio | Council: Feb. '53<br>Relieved: 8 Nov. '56<br>Committee: 8 Nov. '56 |
| Mr. Irwin Pollack<br>AF Operational Applications<br>Laboratory<br>AF Cambridge Research Center<br>Bolling Air Force Base<br>Washington 25, D.C. | 9 May '53 |
| Deputy Member: | |
| Dr. Walter O. Spieth<br>AF Operational Applications<br>Laboratory<br>AF Cambridge Research Center<br>Bolling Air Force Base<br>Washington 25, D.C. | 21 Feb. '58 |
| Lt. Col. John F. Pierce USAF<br>Preventive Medicine Division<br>Office of the Surgeon General<br>HQ, United States Air Force<br>Washington 25, D.C. | 9 May '53<br>Relieved: 7 June '58 |

THE COMMITTEE

Air Force Designated Members

| | Date designated |
|---|---|
| Mr. Edward Poth<br>Sanitary & Industrial Hygiene<br>Engineering Branch<br>USAF Dispensary<br>Kelly Air Force Base<br>San Antonio, Texas | 9 May '53 |
| Dr. O. R. Rogers<br>Address: Commander<br>Wright Air Development Center<br>Attn: WCLSY, Dr. O. R. Rogers<br>Wright-Patterson Air Force Base,<br>Ohio | 9 May '53 |
| Major R. F. Thompson USAF (MSC)<br>Address:<br>Commander<br>Wright Air Development Center<br>Attn: WCRDV, Major R. F. Thompson<br>Wright-Patterson Air Force Base,<br>Ohio | 9 Sept. '55 |
| Mr. Daryle Waldron<br>Address:<br>Commandant<br>School of Aviation Medicine, USAF<br>Attn: SAMCLNM, Mr. Daryle Waldron<br>Randolph Air Force Base<br>Randolph Field, Texas | 7 July '58 |
| Mr. Weiant Wathen-Dunn<br>Air Force Cambridge Research<br>Center<br>L. G. Hanscom Field<br>Bedford, Massachusetts | 9 May '53 |

Affiliated Members

| Organization | Member | Appointment Date |
|---|---|---|
| British Joint Services Mission | Wing Cdr. J. Howitt<br>British Joint Services Mission<br>Air Force Staff<br>1800 K Street NW<br>Washington, D.C. | 1 April '57 |
| Canadian Defence Research Board | Dr. W. J. McNally<br>1509 Sherbrooke Street West<br>Montreal 24, Quebec, Canada | 31 May '55 |

THE COMMITTEE

Affiliated Members

| Organization | Member | Appointment Date |
|---|---|---|
| | Alternate:<br>Dr. Keith K. Neely<br>Defence Research Medical Laboratories<br>P.O. Box 62, Postal Station K<br>Toronto 12, Canada | |
| Canadian Joint Staff | Wing Cdr. J. C. Wickett<br>Staff Officer, Medical Services (Air)<br>Canadian Joint Staff<br>2450 Massachusetts Avenue NW<br>Washington 8, D.C. | 9 Feb. '54 |
| Civil Aeronautics Administration | Mr. Malcolm Y. McCormick<br>Department of Commerce<br>Civil Aeronautics Administration<br>Washington 25, D. C.<br>Alternate:<br>Mr. S. H. Rolle<br>Power Plant Branch<br>Civil Aeronautics Administration<br>Washington 25, D.C. | 22 July '53 |
| Civil Aeronautics Board | Mr. John M. Chamberlain<br>Director, Bureau of Safety Regulation<br>Civil Aeronautics Board<br>Washington 25, D.C. | 11 June '53 |
| Federal Housing Administration | Mr. Marshal L. Ware<br>Chief, Home Mortgage & Subdivision Unit<br>Federal Housing Administration<br>Room 1005, Lafayette Building<br>811 Vermont Avenue<br>Washington 25, D.C. | 28 Feb. '57 |
| National Aeronautics and Space Administration | Mr. George P. Bates<br>National Aeronautics and Space Administration<br>1512 H. Street NW<br>Washington 25, D.C. | 11 Dec. '58 |
| | Dr. T. L. K. Smull<br>National Aeronautics and Space Administration<br>1512 H Street NW<br>Washington 25, D.C. | 22 June '53<br>Relieved: 11 Dec. '58<br>Council: '55-'57 |

## THE COMMITTEE

### Affiliated Members

| Organization | Member | Appointment Date |
|---|---|---|
| National Bureau of Standards | Dr. Richard K. Cook<br>National Bureau of Standards<br>Washington 25, D.C. | 12 June '53 |
| U.S. Atomic Energy Commission | Dr. Leon A. Tarbox<br>Engineering Branch, Division of Construction & Supply<br>U.S. Atomic Energy Commission<br>1901 Constitution Avenue NW<br>Washington 25, D.C. | 17 Sept. '56 |
| U.S. Public Health Service, Bureau of State Services | Mr. Charles D. Yaffe<br>Occupational Health field HQ<br>US Public Health Service<br>1014 Broadway<br>Cincinnati, Ohio | 21 Sept. '55 |
| | Alternate:<br>Mr. Edward Weiss<br>Occupational Health Field HQ<br>U.S. Public Health Service<br>1014 Broadway<br>Cincinnati, Ohio | 28 Sept. '55 |
| U.S. Public Health Service, National Institutes of Health | Dr. Grant Rasmussen<br>Head, Section on Functional Neuroanatomy<br>Laboratory of Neuroanatomical Sciences<br>National Institute of Neurological Diseases & Blindness<br>Bethesda 14, Maryland | 3 July '58 |
| Veterans Administration | Dr. Bernard M. Anderman<br>Chief, Audiology & Speech Correction<br>Physical Medicine & Rehabilitation Services<br>Veterans Administration<br>Washington 25, D.C. | 16 Oct. '56 |

## CALENDAR OF MEETINGS

| | |
|---|---|
| 6 June 1958 | Eighteenth Council Meeting |
| 27, 29-30 October 1958 | Nineteenth Council Meeting |
| 28-29 October 1958 | Sixth Annual Meeting |
| 8 April 1959 | Twentieth Council Meeting |

## SUMMARY OF COUNCIL MEETINGS

Eighteenth Council Meeting: 6 June 1958, Washington, D.C.

Interim reports were received from Working Groups 22, 32 and 33. The status of Working Group 22 was discussed and the Council requested a summary report of their activities and conclusions. By substitution of a guide to the literature it was believed the report could be brief.

The Council discussed the future of CHABA after the expiration in June 1959 of the contract with Central Institute for the Deaf. The governing board of NAS-NRC had previously suggested that the continuing contract be written with the National Research Council as had been the contracts for the Vision and Bio-Astronautics Committees. The Council approved of this suggestion and requested that Dr. Finch continue to explore the possibilities for implementing the continuing contract.

The plans for the program for the 1958 Annual Meeting were discussed and approved. The continuing importance of the problem of noise in communities around airfields was discussed. CHABA does not include experts in social psychology that are prepared to deal with the complex dimensions of interactions in communities. CHABA does include, however, experts who can provide concrete information useful in the solutions of these problems. Accordingly the Council voted to establish Working Group 34 "Community Noise Problems" to determine what are the questions that can logically be put to CHABA that are related to the problem of community noise.

The Council recognized a requirement in the services for a review and listing of audiometers that are currently available together with an indication of how well each meets the requirements and performance specifications for the uses for which each is intended. Working Group 35 "Evaluation of Audiometers" was established as a Joint Service request to undertake the task.

Nineteenth Council Meeting: 27, 29 and 30 October 1959, Washington, D.C.

The Council accepted interim reports from Working Groups 22, 32, 33, 34 and 35. The report from Working Group 34 indicated that CHABA could make significant contributions by setting forth

some responses of individuals to noise in the community. The Council requested the Working Group to proceed along these lines, but wherever possible, to expand the scope to include the responses of groups as well.

The future administration of CHABA was discussed in detail. Earlier a subcommittee of the Council had reviewed several possibilities. The most promising appeared to be one in which CHABA and the Vision Committee would share an Executive Secretary for administrative purposes but remain independent for meetings, working groups, etc. This plan was approved by the Council and Dr. Finch was requested to continue with the arrangements necessary to effect the change.

On 30 October the Vision Committee and CHABA Councils, as a joint committee, voted to approve the plan for organization around a central Secretariat and to recommend strongly the new plan to NAS-NRC for adoption.

Twentieth Council Meeting: 8 April 1959, Washington, D.C.

The Council accepted interim reports from Working Groups 22, 32, 33, 34 and 35. Working Groups 22 and 32 reported major revisions in previous drafts of their reports were in progress. Dr. Finch reported satisfactory progress toward the new joint Secretariat with the Vision Committee.

In a response to a Joint Service request the Council voted to establish Working Group 36, "Critical Evaluation of Methods of Testing and Measurement of Non-Organic Hearing Impairment."

General Samuel Seeley, Executive Secretary for the Armed Forces-National Research Council Committee for Bio-Astronautics reported on the formation and organization of this new committee. He suggested that in the future the Committee on Bio-Astronautics can be expected to turn to CHABA for advice on problems in the CHABA area.

Ralph N. Kraus, Colonel, USAF (MC), was elected the new Chairman of CHABA, and Dr. W. D. Neff was elected Deputy Chairman.

Topics for the 1959 CHABA meeting were considered. It appeared likely that each of Working Groups 32, 34, 35 and 36 could make substantial reports and presentations. Col. Ralph N. Kraus undertook to report on the Air Force's experience to date with monitoring audiometry. In addition, Dr. Davis agreed to summarize the history of CHABA as his final report to the Committee.

PROGRAM

SIXTH CHABA MEETING

Tuesday, 28 October

Morning

Working Group 33: Discussion of Bio-Acoustic Aspects of Rockets, Missiles and Space Travel

Working Group Chairman: J. C. R. Licklider

Working Group Members and Participants:

E. E. Callaghan
C. F. Gell, Capt. (MC) USN
H. E. von Gierke
F. V. Hunt
W. D. Neff
T. L. K. Smull
F. C. Frick
C. S. Gersoni, Col. (MC) USA
F. Guedry
K. U. Ingard
H. O. Parrack
J. C. Webster

Afternoon

Aircraft Noise, Annoyance, and Community Responses

Summary of Jet Engine Flight Noise Suppressors — M. M. Miller

Demonstration Tape of Aircraft Noises — K. D. Kryter

Some of the Human Factors Underlying Community Reactions to Air Force Noise — P. N. Borsky

Wednesday, 29 October

Morning

A Review of Continuing Studies on the Effects of High-Intensity Noise — H. W. Ades

The Monitoring of Hearing Level

Hearing Thresholds of Marine Recruits Before and After Gunfire at Parris Island — G. J. Harbold

Industrial Noise and Hearing Loss in a Controlled Population (Federal Penitentiaries) — C. D. Yaffe

Recent Studies on the Validity of Single-Frequency Screening — W. D. Ward

Hearing Losses Found in Reserve Forces Act Trainees — J. L. Fletcher, Capt. (MSC) USA

Industrial Experiences in Using 4000 Cycle Screening Audiometry — T. G. Hanks

Working Group 32: Discussion of the Establishing of Criteria for Exposure to Impulse Type Noises

Working Group Chairman: W. A. Rosenblith

Working Group Members:

J. R. Cox, Jr.
J. L. Fletcher, Capt. (MSC) USA
J. D. Harris
M. L. Lawrence
W. D. Ward

Afternoon

Communication in Noise

Voice Communications in Noise (Taped Demonstration) — G. C. Tolhurst

The NEL Flight Deck Communication System — J. C. Webster, D. C. Gibson, R. S. Gales

Criteria for Noise Control in the USSR — R. H. Bolt, D. H. Eldredge

## SUMMARY OF THE SIXTH

## ANNUAL MEETING

The first portion of the program was a presentation by Working Group 33, on the Bio-Acoustic Aspects of Rockets, Missiles, and Space Travel. This Working Group had been asked to point out where bio-acoustic problems might be expected, and, if possible, to estimate their severity. The Chairman of the Working Group, J. C. R. Licklider, introduced the subject by analyzing the system for sources of sound and for positions in which the sound might be hazardous for man or in which man's efficiency might be impaired by the sound.

H. E. von Gierke presented data on noise levels that can be anticipated from rocket engines with static firing and after launch, and on the noise levels that can be anticipated from aerodynamic flow around the rocket. In the ear canal of the pilot these may briefly be as high as 130-140 db overall SPL. Shortly after launching these levels should drop to about 80 db in the 300-600 cps band. E. E. Callaghan reported estimates of the aerodynamic noise on re-entry of the earth's atmosphere. The maximum overall level will probably be about 135 db in any one octave band outside the vehicle, with the level inside 15 to 30 db less depending on frequency.

J. C. Webster reported briefly on Navy problems associated with the launching of rockets and missiles. The confined spaces of cruisers and submarines do not allow personnel to place much distance between themselves and the missiles. Other techniques for isolation are necessary. Underwater "pop-up" launchings from submarines appear promising. No measurements have been reported of the sound levels appearing in the water for this method of launching.

H. O. Parrack spoke briefly on the problem of noise arising from the machinery in aircraft, and to be expected in a space capsule. Small, high velocity blowers and high speed motors and electrical generators produce moderately high noise levels, particularly in the frequency range important for speech communication. These devices are used frequently because they are efficient in terms of their cost in weight to the vehicle. Although the noise levels produced are not extraordinarily high they are of practical concern for two reasons. First, without careful acoustic planning the noise levels may prevent speech communication. Secondly, these moderate noise levels may prove hazardous for the ear and hearing if they are to be sustained 24 hours a day for long periods without any chance for rest and recovery.

F. C. Frick elaborated more fully on the problems of communication. For distances as far as Venus, communication should be possible. As far as the moon, one to ten watts power is adequate for communication in narrow band-width channels. Bandwidths adequate for speech communication require about 10 decibels more power with a corresponding weight penalty. It was

Frick's opinion that people like speech best, and that speech communication may be necessary to help the lonely astronaut remain oriented to the earthly frame of reference of time and place.

K. U. Ingard reported on the noise generated by rocket engines in terms of the spread of noise to neighboring areas. A rocket engine with a thrust of 130,000 pounds will produce sound levels of 145 db at a distance of 100 feet and the noise will exceed a speech interference level of 60 db up to five miles distance. These levels will not be greatly exceeded by larger rocket engines, primarily because the pressures already are exceeding the linear limits of air as a transmission medium. The spread of noise is further complicated by local weather conditions. But in general rocket launching sites should be planned with these sound levels in mind.

H. E. von Gierke also reported on problems in vibration that may arise during launch and re-entry of space vehicles. The first mechanical resonance for structures of the human bodies occurs at about four to six cps. Mechanical vibrations in space-vehicle structures could present problems at these frequencies and up through the lower audio-frequency range. Above 2000 cps the vibratory energy is attenuated rapidly and will probably not be troublesome. If the rate of the sudden loss of acceleration at burn-out should match a resonance of the body, injury may occur. Similar single or repeated decelerations on re-entry should be considered in advance in relation to resonances of the human body.

Note: The above presentations will be summarized in more detail in a report from Working Group 33. The data presented by H. E. von Gierke has also appeared in Noise Control, 5: 144-152 (1959).

M. M. Miller reviewed the principles and designs that have been tried for jet engine noise suppressors. The more promising designs are now in use and essentially confirm the predictions of Working Groups 24 and 30. Sound power reductions of about six decibels have been achieved together with reductions of sound pressure of about 14 decibels in the direction of maximum sound radiation. The sound pressures are reduced slightly more in terms of the radiation commonly spreading to airport neighbors and slightly less for those who must work near the aircraft. It is noteworthy that the use of retractable suppressors and combinations of the suppressor with a thrust reversing mechanism has minimized the drag and weight penalties that were anticipated.

K. D. Kryter reported on a study in which tape recordings of jet and propellor-driven aircraft noises were played at various levels for panels of listeners. He used the technique of paired comparisons and asked listeners to choose the noise that the listener found less objectionable or more acceptable. Rank orders established by these comparisons could not be explained fully by overall sound pressure levels, loudness levels,

or speech interference levels. A new calculation, combining data from experiments of S. S. Stevens on loudness of bands of noise and from experiments on annoyance of bands of noise, was found to explain the rank orders observed more fully. Kryter called the new formulation "perceived noise level." The practical implications of the study can be summarized as follows: At small distances and/or low altitudes, jet engine noise is significantly less acceptable than propeller noise of the same overall sound pressure level. At larger distances and/or higher altitudes, jet engine noise is about as acceptable as propeller noise of the same overall level.

P. N. Borsky reported on analyses of the results of 2328 interviews with persons living near three Air Force air bases. In addition to the duration that aircraft noise exceeded a speech interference level of 60 db, the following factors in respondents' answers to questions appeared to determine their readiness to complain about aircraft noise: a) fear of aircraft and of aircraft crashes, b) opinion of how considerate air base personnel were of respondent's feelings, c) opinion on the importance of the air base, and d) readiness to be annoyed by real or fancied disturbances that may be related to noise or to any other inconveniences of living in the neighborhood.

H. W. Ades reported progress on two areas of study in bioacoustics at the Naval School of Aviation Medicine. The first study was on the thresholds for dizziness, nystagmus, and pain when one or both ears of profoundly deaf subjects are exposed to very high sound pressure levels. The data presented confirmed and extended those reported at previous CHABA meetings and in reports from the School of Aviation Medicine. Current experiments were proceeding with great caution because pin-point hemorrhages had been observed on the tympanic membranes of one subject. Dr. Ades also reported the initiation of studies on the psychophysical performance of subjects in jet-engine noise in the field.

One session was devoted to invited reports related to the monitoring of hearing level. Hearing thresholds before and after exposure to gunfire among Marine trainees at Parris Island and among Reserve Forces Act trainees at Fort Knox were the topics of two reports. Mean and median hearing thresholds were unchanged in both groups. Captain Fletcher presented a more detailed analysis of his data. This analysis strongly suggested that a low percentage of the persons exposed did show persisting threshold shifts of 15 to 55 db at 4 kc and 8 kc. Opposing this trend was a small "practice" effect or apparent improvement in hearing threshold level in the majority of the population.

C. D. Yaffe reported a study on permanent and temporary threshold shifts which was an extension of a previous article (Yaffe, Jones and Weiss, Amer. Indust. Hygiene Assoc. J., 19: 296-312, 1958). Hearing threshold levels were measured on prisoners working in the noisiest department, the weave room, of the cotton mill in the federal penitentiary at Atlanta, Ga. Operations in the weave room were suspended for one week for alterations. Hearing levels were measured before the shut-down, at the

end of the shut-down, and again after operations had been resumed for one week. The hearing levels at the end of the rest period were improved and indicated that roughly half of the threshold shifts were temporary. As soon as the exposures were resumed hearing levels returned to their initial values. The close agreement between the initial and the final measurements suggested that the measurements had been quite reliable.

W. D. Ward and T. G. Hanks each reported on the usefulness of monitoring hearing level with a single frequency. The general conclusion appeared to be that so long as the hearing threshold level for 4000 cps was not worse than 50 db only about 1% of ears would show worse hearing at any lower frequency. Accordingly, the technique appears to be valid. In practice, however, the test may not be reliable, especially when carelessly administered. This difficulty may be partially overcome by the inclusion of a second test tone of 1500 cps or 2000 cps.

Dr. Hanks reported that this abbreviated monitoring system was not always the more economical technique. This is especially true when a worker must be away from the job for a long time in order to go to a distant dispensary every time a hearing test is indicated. Using a portable test booth he has found that full air-conduction audiograms take little more time than one- or two-frequency screening, are more reliable, provide better protection for employees, and eliminate all non-essential trips to the dispensary.

Two demonstrations dealt with the problem of voice communications near operational jet engines. A tape recording of speech presented to throat and to noise-shielded microphones in the worst jet-engine near-field noise levels was presented by G. Tolhurst. Marginal intelligibility for a very restricted vocabulary was maintained for all but the most extreme conditions. J. C. Webster reported on the development at the Navy Electronics Laboratory of a flight deck communications system. The development was based on a job and noise analysis of the flight deck crew and environment and included the primary flight control station. The system incorporated and applied many principles derived from basic research on speech communication in noise and in so doing led to a nearly complete replacement of old equipment. Among the new features incorporated in the system were:

1. noise-shielded, noise-cancelling microphones
2. compression amplification
3. "walkie-talkie" sets incorporated in helmets
4. dynamic earphones
5. improved earphone cushions
6. air-modulated loud speakers
7. acoustic treatment of primary flight control station
8. television monitoring of flight deck in primary flight control station.

The superiority of this new system had been demonstrated through formal speech intelligibility tests and actual launching and retrieving operations from the flight deck of a carrier. The

latter was effectively demonstrated by means of a sound film.

D. H. Eldredge reported on noise abatement activities in U.S.S.R. and on the legal noise standards in U.S.S.R. The problems faced in Russia were comparable to those in the United States. The criteria for noise control were more stringent than many in the United States would believe necessary and had been legally set as goals for Soviet industry. Where these criteria cannot yet be met, regulations enforce other precautionary measures.

Summary of Working Group Activities

WORKING GROUP 22

"Criteria for Hazardous Noise Exposures"

Status: Active

Requested by: Letter from Major Albrite dated 15 April 1955, forwarding the request of Captain Edward H. Headley (MC) USA of the Environmental Health Laboratory, Army Chemical Center. Modified to a Joint Armed Services request on 5 December 1955.

Purpose: To distinguish a hazardous from a non-hazardous noise exposure.

Membership:

Walter A. Rosenblith, Chairman

C. I. Barron
Aram Glorig
Gordon Hoople
Wayne Rudmost
H. Schuknecht

Army

R. Cramer
Col. John R. Hall (MC)
R. Edwin Shutts

Air Force

Col. J. C. Carmichael (MSC)
H. E. von Gierke
Karl Kryter
Major R. F. Thompson
Lt. Col. C. N. Moss (MC)

Navy

John F. Hyland
Cdr. J. Siegel (MSC)
John C. Webster

Meetings. 26 October 1955, Washington, D.C.
11-12 December 1955, Boston, Massachusetts
10 June 1956, Cambridge, Massachusetts
30 October 1956, Washington, D.C.

Activities:

A final report, summarizing the factors that must be considered in writing criteria, and including some of the history of the writing of criteria, has been prepared by the Secretariat for Working Group approval.

Reports: 1) Interim Report, 1 March 1956 (AFR 160-3 material)

Major Conclusions:

The criteria for hazardous noise exposures given in Volume II of the Handbook of Acoustic Noise Control for long term exposures, or derived from them by the equal energy assumption for short term exposures, are consistent with present information. When the presence of a pure tone component is suspected, programs designed to control noise exposure should become mandatory at levels of 85 db in the relevant octaves instead of at 95 db.

WORKING GROUP 32

"Criteria for Impulse Type Noise"

Status: Active

Requested by: Letter from Colonel Gersoni dated 28 November 1956, forwarding the request of Lt. Col. Joseph R. Blair, Commander, Army Medical Research Laboratory. Modified to a Joint Armed Services request on 29 January 1957.

Purpose: To distinguish between a hazardous and a non-hazardous exposure to impulse noises.

Membership:

Walter A. Rosenblith, Chairman

Jerome R. Cox, Jr.
Aram Glorig

Army

Capt. John L. Fletcher (MSC)
Merle Lawrence

Air Force

Col. Paul A. Campbell (MC)

Navy

Robert Gales
J. Donald Harris
John C. Webster

Meetings: 25 May 1957, New York City
10-11 October 1957, Fort Knox, Kentucky
15 February 1958, Los Angeles, California
28 October 1958, Washington, D.C.

Activities:

A demonstration firing of various heavy weapons was witnessed by the Working Group at Fort Knox. A significant number of cases of acoustic trauma are reported at the Fort Knox Station Hospital. The nature of the trauma and the conditions of exposure will be investigated. The Working Group considered the potentialities of the Army's blast tubes for research on impulse and blast phenomena. A subcommittee met in Los Angeles to organize and prepare the rough draft of the final report. The outline for the report was revised by Prof. Rosenblith and Dr. Eldredge and was circulated to the Working Group.

At the Washington meeting the draft report that had been circulated was considered and it became apparent that the report as drafted was too cumbersome and attempted to do too many things at once. A brief statement and a set of recommendations is now in preparation as the final report. Other pertinent information is also being summarized in a set of brief additional statements or reports. The latter material will be appended to the final report in support of the recommendations.

WORKING GROUP 33

"Bio-Acoustic Aspects of Rockets, Missiles, and Space Travel"

Status: Active

Requested by: Joint Armed Services request on 4 February 1958.

Purpose: To determine the bio-acoustic problems that may be associated with rockets, missiles, and space travel.

Membership:

J. C. R. Licklider, Chairman

F. V. Hunt
W. D. Neff
T. L. K. Smull

Air Force

H. O. Parrack
H. E. von Gierke

Army

Col. C. S. Gersoni (MSC)
Frederick Guedry

Navy

Robert S. Gales
Capt. Charles F. Gell (MC)

Meetings: 7 March 1958, New York City
15 May 1958, Washington, D.C.
27 October 1958, Washington, D.C.

Activities:

Members of the Working Group concluded that its assignment fell into four areas. These concern the problems that arise in rocketry during a) static test, b) launch, c) cruise in space, and d) re-entry into the earth's atmosphere. Answers to the problems in each area will be in two parts, one for rockets and one for satellites. Questions to be applied to each of the four areas given above were prepared by the Working Group, and a discussion was presented to the CHABA Annual Meeting in October 1958, as an interim report.

It was the consensus of the presentation at the CHABA meeting that there probably will not be problems that require fundamental research in this area. It is apparent, however, that space travel will be accompanied by noise, and that, for purposes of communication and of protection of hearing, some measures will have to be taken to control the noise levels under certain conditions. Given more accurate measures of the noise conditions that do exist, acoustic consultants can specify the measures that will be necessary to control the noise satisfactorily. However, unless these steps are taken in the planning stages for space vehicles, the opportunity for really effective and relatively easy noise control may be lost. Since success or failure of a space mission can easily be determined by the effectiveness of communication, adequate noise control is essential for successful space flight.

WORKING GROUP 34

"Community Noise Problems"

Status: Active

Requested by: Joint Armed Services request, 6 June 1958.

Purpose: To determine what questions can logically be put to CHABA relevant to community noise problems.

Membership:

Kenneth N. Stevens, Chairman

D. H. Eldredge
Karl Kryter
H. O. Parrack
Paul Borsky
W. Dixon Ward
Welden Clark*

Meetings: 9 October 1958, Dayton, Ohio
26-27 March 1959, Cambridge, Massachusetts

Activities:

An informal report of the first meeting was presented to the Nineteenth Council Meeting. The Working Group considers that CHABA can and should be prepared to provide information about the responses of individuals to noise in the following areas: hearing loss, speech communication, and possibly acceptability ratings of aircraft noise.

At its second meeting the Working Group examined data and reached conclusions about the kind of report it can write.

Reports: By a letter of 25 February 1959, Drs. Eldredge, Kryter and Stevens acting as a subcommittee of the Working Group recommended to the CHABA Council that the Air Force sponsor further work on the NORC report to bring it to a form suitable for general distribution. They further recommended that the report be prepared with the advice and comments of experts in acoustics and the Air Force representatives at the Wright Air Development Center.

At the meeting of 8 April 1959 the Council approved this letter report and urged the Air Force to proceed according to the recommendation.

WORKING GROUP 35

"Evaluation of Audiometers"

Status: Active

Requested by: Joint Armed Services request, 6 June 1958.

* By invitation.

Purpose: To list and review currently available audiometers and indicate how well each meets the performance specifications and requirements of the types of audiometry for which each is suited.

Membership:

Robert W. Benson, Chairman

Jerome R. Cox, Jr.
Edward P. Fowler, Jr.
David Green
Irving Pollack
Richard Trumbull

Meetings: 30 July 1958, St. Louis, Missouri (Steering Committee)
28 October 1958, Washington, D.C.

Activities:

A preliminary meeting was held in St. Louis by Drs. Benson, Cox, and Davis in order to make use of the summer months to elicit replies from the various audiometer manufacturers that would provide the basic materials for decisions by the Working Group. The Secretary to the Working Groups sent letters to the audiometer manufacturers as well as those who have constructed special-purpose audiometers, and considerable data were received and distributed to the members of the Working Group. At the Washington meeting an outline for the first draft was approved. It was agreed that the report now in preparation should be a preliminary report. Dr. Benson is now preparing the first draft.

## WORKING GROUP 36

"Critical Evaluation of Methods of Testing and Measurement of Non-organic Hearing Impairment"

Status: Active

Requested by: Joint Armed Services request, 8 April 1959.

Purpose: To provide a critical evaluation of the methods of testing and measurement of non-organic hearing impairment together with recommendations for any further research or development that appears desirable.

Membership:

Bernard Anderman, Chairman

Raymond Carhart
Meyer S. Fox
W. D. Neff
Leo Doerfler*
Aram Glorig
Josef Zwislocki

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* By Invitation.

## SECRETARIAT ACTIVITIES

On 19 June 1958 Drs. Davis, Finch, Neff, Trumbull and Colonel Gersoni met at the National Research Council Building to discuss the possibility of establishing a joint administrative secretariat for CHABA and the Vision Committee. Various proposals were circulated during the summer.

On 8-11 September 1958 Dr. Davis attended the First International Symposium on Submarine and Space Medicine, sponsored by the American Institute of Biological Sciences, held at the U.S. Naval Medical Research Laboratory at New London, Connecticut. Dr. Davis established liaison between Dr. J. C. R. Licklider and Dr. Howard Jacobs of Space Technology Laboratories. Dr. Jacobs is interested in the problem under study by Working Group 33.

On 20 January 1959 Drs. Davis, Geldard, Trumbull, Finch and Miles met at the National Research Council Building to discuss the positions of Technical Director (Scientific Advisor) and of the Executive Secretary of the joint CHABA-Vision Committee secretariat, and the size and make-up of the memberships of the two Committees. These questions were considered in relation to the probable topics that the Committees may be asked to handle.

## REPORTS

The following is a cumulative list of the reports prepared and distributed by the Committee on Hearing and Bio-Acoustics.

A. CHABA Reports:

1. "High Intensity Noise and Military Operations: An Evaluation." 25 January 1954. CHABA Report No. 1. Technical Report No. 1 to the Office of Naval Research from the Central Institute for the Deaf, Contract No. Nonr 1151 (01), NR 140-069.

2. "The Effects of Blast Phenomena on Man," by D. H. Eldredge, 1 September 1955, Report No. 3. Technical Report No. 4 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

3. "Noise and the Community" - The Proceedings of the Second Meeting of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics, a joint meeting with the National Advisory Committee for Aeronautics Special Subcommittee on Aircraft Noise, 25-26 October 1954. October 1955, CHABA Report No. 4. Technical Report No. 5 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

4. "The Testing of Hearing in the Armed Services" - The Proceedings of the Third Annual Meeting of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics, 25-26 October 1955. 1 June 1956, CHABA Report No. 5. Technical Report No. 8 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

5. "Monitoring Audiometry and the Medical Disposition of Cases of Hearing Loss," Final Report of Working Group 25. June 1957, CHABA Report No. 6. Technical Report No. 11 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

B. Memorandum Reports:

1. "Evaluation of Methods for Reducing Noise from Jet Aircraft Engines in Flight," Final Report of Working Group 24. May, 1956, CHABA Memorandum Report No. 1. Technical Report No. 6 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

2. "Hearing Conservation Data and Procedures," Final Report of Working Group 21. June 1956, CHABA Memorandum Report No. 2. Technical Report No. 7 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

3. "Estimate of Performance of Jet Engine Noise Suppressors for Flight Use," Final Report of Working Group 30. June, 1957, CHABA Memorandum Report No. 3. Technical Report No. 13 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

4. "Instrumentation for the Measurement and Generation of High Intensity Sound," Final Report of Working Group 29. September, 1957, CHABA Memorandum Report No. 4. Technical Report No. 14 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

C. Annual Reports:

1. First Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1954, CHABA Report No. 2. Technical Report No. 2 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

2. Second Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1955. Technical Report No. 3 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

3. Third Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1956. Technical Report No. 9 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

4. Fourth Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1957. Technical Report No. 10 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

5. Fifth Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1958. Technical Report No. 15 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

## REPORTS NOW IN PREPARATION

A. CHABA Reports:

1. Final Report of Working Group 22, (Title not yet selected) CHABA Report No. 7. Technical Report No. 12 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

2. Final Report of Working Group 32, (Title not yet selected) CHABA Report No. 8. Technical Report No. 17 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

B. Annual Reports:

1. Sixth Annual Report of the Armed Forces-National Research Council Committee on Hearing and Bio-Acoustics. 1 June 1959. Technical Report No. 16 to the Office of Naval Research from the Central Institute for the Deaf, Contract Nonr 1151 (01), NR 140-069.

## CHABA REPORTS AND MISCELLANEOUS REPORTS PRESENTED AT CHABA MEETINGS THAT HAVE ALSO BEEN PUBLISHED ELSEWHERE


1. Glorig, A. and Quiggle, R., "A Hearing Conservation Data Card," Noise Control, 2: 34-42, November 1956.

2. "Recent Progress in Hearing and Bio-Acoustics," Fourth CHABA Meeting. The speeches of Major General Silas B. Hayes MC, USA, Brig. General Marvin C. Demler, USAF, and Rear Admiral Rawson Bennett II, USN. Noise Control, 3: 39-44, May 1957.

3. The CHABA Statement of Purposes and Methods of Operation, Noise Control, 3: 53-54, November 1957.

4. Davis, H. and Usher, J. R., Eds., "What is Zero Hearing Loss?" Journal of Speech and Hearing Disorders, 22: 662-690, 1957.

5. Usher, J. R., Ed., "Problems in Military Audiometry," Journal of Speech and Hearing Disorders, 22: 731-756, 1957.

6. Davis, Hoople, G. and Parrack, H. O., "The Medical Principles of Monitoring Audiometry," AMA Archives of Industrial Medicine, 17: 1-20, 1958.

7. Davis, H., "Effects of High-Intensity Noise on Naval Personnel," U. S. Armed Forces Medical Journal, 9: 1027-1048, 1958.

8. Kamperman, G. W., "Measurement of High Intensity Noise," Noise Control, 4: 22-27, September 1958.

9. von Gierke, H. E., "Vibration and Noise Problems Expected in Manned Space Craft," Noise Control, 5: 144-152,

10. von Gierke, H. E., Parts of Chapter 33, "Aircraft Noise Sources" and Chapter 34, "Aircraft Noise Control," in C. M. Harris, Ed., Handbook of Noise Control, New York: McGraw-Hill Book Company, 1957.

## ESTABLISHMENT OF JOINT SECRETARIAT WITH THE VISION COMMITTEE

Beginning in September 1959 the CHABA Secretariat will be based at the National Research Council office in Washington. The exact physical location of the office of the Executive Secretary has not yet been decided and it will probably not be in the National Academy Building itself. The contract under which CHABA will operate will be between the Office of Naval Research and the National Research Council.

An important modification of the Secretariat is its consolidation with the Secretariat of the Vision Committee into a single office with a single Executive Secretary. The new arrangement involves also a reassignment of duties and responsibilities of the Executive Secretary, the abolition of the position of Technical Aide and the creation of the new office of Scientific Advisor.

There will be one Scientific Advisor for CHABA and another for the Vision Committee. The Scientific Advisor will advise the Chairman of CHABA and the Executive Secretary in assessing questions submitted to CHABA between Council meetings and either appointing a Working Group or formulating an answer by the Secretariat as seems appropriate. He will review the reports of Working Groups before these reports are submitted to the Council and he may assist in interpreting to Working Groups the missions assigned to them by the Council. The Scientific Advisor will usually not be located in Washington. The first Scientific Advisor of CHABA will be Prof. Richard H. Bolt of the Massachusetts Institute of Technology. Professor Bolt, it will be recalled, was also the first Chairman of CHABA.

The Executive Secretary, under the new arrangement, absorbs most of the duties of the former Technical Aide. He will handle the correspondence, the records, the financial affairs, the Annual Meeting, and the printing of CHABA reports. The printing of such material as is not published in scientific periodicals will be through the NRC publications office. Dr. Glen Finch, the secretary of the NRC Division of Anthropology and Psychology, will have general oversight and responsibility for the financial, administrative and publication activities.

The Executive Secretary will assist the Chairmen of Working Groups in arranging Working Group meetings, in assembling and organizing material for the Group, in the preliminary drafting and in the final editing of the reports. The actual preparation of the reports will, of course, remain the responsibility of the Chairman of each Working Group.

The Executive Secretary and the NRC organization represented by Dr. Finch will perform similar services for the Vision Committee. The first Executive Secretary of CHABA and the Vision Committee jointly will be Dr. Milton Whitcomb, now of the University of Texas.

From the point of view of the Council and of the CHABA membership the new organization of the Secretariat should make little

difference. The CHABA and the Vision Committee Councils will operate in the same way as at present and will have the same duties and responsibilities. Experience and changes in the pressure of activity may lead to minor changes in procedure from time to time but the Council will remain the policy-forming group of CHABA. It will have the responsibility of accepting questions submitted by the Armed Forces, of establishing Working Groups, of accepting their reports and perhaps adding its own endorsements, and also for determining the general character of the annual meetings. CHABA and the Vision Committee will remain independent of one another in their respective fields of technical interest and competence. They should both benefit from a common secretariat, which should be able to handle the administrative affairs with greater efficiency, and from the closer relation to the parent National Academy-National Research Council organizations.